

## PATENT COOPERATION TREATY

PCT

NOTIFICATION OF THE RECORDING  
OF A CHANGE(PCT Rule 92bis.1 and  
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

MINOJA, Fabrizio  
Bianchetti Bracco Minoja S.r.l.  
Via Rossini, 8  
I-20122 Milano  
ITALIE

|  |   |
|--|---|
| Date of mailing (day/month/year)<br>23 October 2001 (23.10.01) | <b>IMPORTANT NOTIFICATION</b>   |
| Applicant's or agent's file reference<br>SCB563PCT             |   |
| International application No.<br>PCT/EP00/05356                | International filing date (day/month/year)<br>09 June 2000 (09.06.00) |

|   |   |  |
|---|---|--|
| 1. The following indications appeared on record concerning:   |   |  |
| <input checked="" type="checkbox"/> the applicant   | <input type="checkbox"/> the inventor                             | <input type="checkbox"/> the agent <input type="checkbox"/> the common representative                                |
| Name and Address<br>FARMATRON LIMITED<br>48 Conduit Street<br>London W1R 9FB<br>United Kingdom                    | State of Nationality<br>GB  | State of Residence<br>GB   |
|   | Telephone No.   |  |
|   | Facsimile No.   |  |
|   | Teleprinter No.   |  |
| 2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning: |   |  |
| <input checked="" type="checkbox"/> the person  | <input type="checkbox"/> the name                                 | <input type="checkbox"/> the address <input type="checkbox"/> the nationality <input type="checkbox"/> the residence |
| Name and Address<br>COSMO S.p.A.<br>Piazza della Repubblica 3<br>I-20121 Milano<br>Italy                          | State of Nationality<br>IT  | State of Residence<br>IT   |
|   | Telephone No.   |  |
|   | Facsimile No.   |  |
|   | Teleprinter No.   |  |
| 3. Further observations, if necessary:  |   |  |
| 4. A copy of this notification has been sent to:  |   |  |
| <input checked="" type="checkbox"/> the receiving Office  | <input type="checkbox"/> the designated Offices concerned         |  |
| <input type="checkbox"/> the International Searching Authority  | <input checked="" type="checkbox"/> the elected Offices concerned |  |
| <input type="checkbox"/> the International Preliminary Examining Authority  | <input type="checkbox"/> other:                                   |  |

|   |   |
|---|---|
| The International Bureau of WIPO<br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland<br>Facsimile No.: (41-22) 740.14.35 | Authorized officer<br>R. Raissi<br>Telephone No.: (41-22) 338.83.38 |
|---|---|

## . ATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner  
 US Department of Commerce  
 United States Patent and Trademark  
 Office, PCT  
 2011 South Clark Place Room  
 CP2/5C24  
 Arlington, VA 22202  
 ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

|  |  |
|--|--|
| <b>Date of mailing (day/month/year)</b><br>15 February 2001 (15.02.01)       |  |
| <b>International application No.</b><br>PCT/EP00/05356                       | <b>Applicant's or agent's file reference</b><br>SCB563PCT        |
| <b>International filing date (day/month/year)</b><br>09 June 2000 (09.06.00) | <b>Priority date (day/month/year)</b><br>14 June 1999 (14.06.99) |
| <b>Applicant</b><br>VILLA, Roberto et al                                     |  |

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

08 January 2001 (08.01.01)

☐ in a notice effecting later election filed with the International Bureau on:2. The election ☒ was☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

|  |  |
|--|--|
| <b>The International Bureau of WIPO</b><br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland | <b>Authorized officer</b><br><br>Pascal Piriou |
| Facsimile No.: (41-22) 740.14.35   | Telephone No.: (41-22) 338.83.38               |

# PATENT COOPERATION TREATY

## PCT

### INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

|   |   |   |
|---|---|---|
| Applicant's or agent's file reference<br><b>SCB563PCT</b>                                       | <b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) |   |
| International application No.<br><b>PCT/EP00/05356</b>  | International filing date (day/month/year)<br><b>09/06/2000</b>   | Priority date (day/month/year)<br><b>14/06/1999</b> |
| International Patent Classification (IPC) or national classification and IPC<br><b>A61K9/16</b> |   |   |
| Applicant<br><b>CIP-NINETY TWO-92 S.A. et al.</b>   |   |   |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 6 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

|   |  |
|---|--|
| Date of submission of the demand<br><br><b>08/01/2001</b>   | Date of completion of this report<br><br><b>30.07.2001</b>   |
| Name and mailing address of the international preliminary examining authority:<br><br> <b>European Patent Office</b><br><b>D-80298 Munich</b><br><b>Tel. +49 89 2399 - 0 Tx: 523656 epmu d</b><br><b>Fax: +49 89 2399 - 4465</b> | Authorized officer<br><br><b>Hedegaard, A</b><br><br><b>Telephone No. +49 89 2399 8644</b>  |

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/05356

## I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

**Description, pages:**

1-18 as originally filed

**Claims, No.:**

1-14 with telefax of 04/06/2001

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/05356

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:  
**see separate sheet**

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

|                               |                  |
|-------------------------------|------------------|
| Novelty (N)                   | Yes: Claims      |
|                               | No: Claims 1-14  |
| Inventive step (IS)           | Yes: Claims      |
|                               | No: Claims 1-14  |
| Industrial applicability (IA) | Yes: Claims 1-14 |
|                               | No: Claims       |

2. Citations and explanations  
**see separate sheet**

## VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

## VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:  
**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/EP00/05356

**Re Section I**

Additional observations

1. In claim 1 filed with letter of 04.06.2001 the feature "with melting point lower than 90°C in which the active ingredient is at least partially inglobated" has been deleted. Instead said claim has been amended to the aspect of the invention disclosed on page 5, lines 8-22 of the description. However, this aspect contains certain restrictions on the amphiphilic matrix (consisting of polar lipids etc.) and on the hydrophilic matrix (formed by saccharide etc.). These restrictions are not to be found in the new claim 1. Therefore, the amendments filed with the letter dated 04.06.2001 introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT.

**Re Section V**

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

D1: DE-A-41 31 562

D2: US-A-5 597 844

D3: WO-A-99 11245

D4: EP-A-0 514 008

D5: WO-A-99 17752

D1 discloses (see claims 1-7, 10 and 15) oral pharmaceutical compositions comprising a solid core consisting of lipophilic compounds (e.g. a fatty alcohol such as cetylalcohol or a wax such as cetylpalmitat) in which the active agent is inglobated; a stabilising agent such as lecithin; and an outer hydrophilic matrix (an aqueous medium) in which the lipophilic phase is dispersed.

D2 discloses (see example 6) oral pharmaceutical compositions comprising a matrix consisting of lipophilic compounds (partially hydrogenated soybean oil) in

which the active agent is inglobated; and an outer hydrophilic matrix (comprising e.g. alginic acid) in which the lipophilic matrix is dispersed.

D3 discloses (see preparations 1-3 on p. 4, l. 29 - p. 6, l. 10) oral pharmaceutical compositions comprising a matrix consisting of lipophilic compounds in which the active agent is inglobated (stearine coated dimenhydrinate); and an outer hydrophilic matrix (preparation 3 comprising mannitol and sorbitol) in which the lipophilic matrix is dispersed.

D4 discloses (see claim 1) oral pharmaceutical compositions containing a matrix consisting of active agent and a polyglycerol fatty acid ester or a lipid; and an outer hydrophilic matrix (comprising a viscogenic agent such as cellulose ethers).

D5 discloses (see claims 1-4 and 8) oral pharmaceutical compositions containing a matrix consisting of active agent and carnauba wax; and an outer hydrophilic matrix (a blend of hydroxypropylcellulose and ethylcellulose polymers).

2. The subject-matter of claim 1 is not novel (Art. 33(2) PCT) over D1 (see above under item 1). It is here pointed out that the amphiphilic matrix as defined in present claim 1 cannot establish novelty since D1 discloses the presence of lecithin (= amphiphilic matrix). Furthermore, the term "matrix" in present claim 1 is not considered suitable to distinguish the subject-matter from the "solid core" disclosed in D1.
3. Claims, that are not novel cannot involve an inventive step (Art. 33(3) PCT).

However, it is here noted that D1 does not mention the problem of taste-masking and that D2-D5 are not disclosing formulations comprising a lipophilic, an amphiphilic and a hydrophilic matrix as defined in present claim 1. Hence, it appears that if the above-mentioned objections are overcome then inventive step can be acknowledged.

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/EP00/05356

4. A positive international preliminary report for the subject-matter of the dependent claims 2-14 can only be established when they refer to an independent claim which meets the requirements of the PCT.

**Re Section VII**

Certain defects in the international application

1. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.

**Re Section VIII**

Certain observations on the international application

1. The term "optional" in claim 1 (line 3 from the bottom) should be deleted since this feature is no longer optional.



# PATENT COOPERATION TREA

# PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

|   |   |  |
|---|---|--|
| Applicant's or agent's file reference<br><b>SCB563PCT</b> | <b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below. |  |
| International application No.<br><b>PCT/EP 00/ 05356</b>  | International filing date (day/month/year)<br><b>09/06/2000</b>   | (Earliest) Priority Date (day/month/year)<br><b>14/06/1999</b> |
| Applicant<br><br><b>CIP-NINETY TWO-92 S.A.</b>            |   |  |

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

--  
☐ None of the figures.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 00/05356

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 A61K9/16 A61K9/20

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, PAJ, EPO-Internal, CHEM ABS Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No.  |
|------------|--|------------------------|
| X          | DE 41 31 562 A (MEDAC)<br>25 March 1993 (1993-03-25)<br>claims 1-12<br>page 3, line 25 - line 31<br>---  | 1-7, 10                |
| X          | US 5 597 844 A (SUSHIL CHAUHAN, ET AL.)<br>28 January 1997 (1997-01-28)<br>claims 1,3,9<br>column 2, line 14 -column 3, line 15<br>examples 1,6<br>--- | 1-3,5-7,<br>10,14,15   |
| X          | EP 0 514 008 A (TAKEDA)<br>19 November 1992 (1992-11-19)<br><br>claims 31,33,34<br>page 3, line 23 -page 5, line 29<br>examples 1,3<br>---<br>-/--     | 1-3,<br>5-10,12,<br>13 |



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

° Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

6 November 2000

Date of mailing of the international search report

13/11/2000

Name and mailing address of the ISA

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NL - 2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
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Authorized officer

Ventura Amat, A

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP 00/05356

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No.          |
|------------|--|--------------------------------|
| X          | GB 935 639 A (HOFFMANN-LA ROCHE)<br><br>claim 1<br>examples 1,5<br><br>----  | 1-3, 5-7,<br>10, 12, 13        |
| X          | WO 99 11245 A (PHARMACIA & UPJOHN)<br>11 March 1999 (1999-03-11)<br><br>claims 1, 4, 9<br>page 4, line 29 -page 6, line 20<br><br>---- | 1-3, 5-7,<br>10, 12,<br>14, 15 |
| X          | WO 99 17752 A (FUISZ)<br>15 April 1999 (1999-04-15)<br><br>claims 1-4, 8<br>examples 1, 2, 5, 6<br><br>-----                           | 1-3, 5-7,<br>10-12,<br>14, 15  |

## INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 00/05356

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s)  | Publication<br>date  |
|---|---------------------|---|--|
| DE 4131562 A                              | 25-03-1993          | AT 135567 T<br>AU 672177 B<br>AU 2561592 A<br>CA 2119253 A,C<br>CZ 9400596 A<br>DE 59205783 D<br>DK 605497 T<br>WO 9305768 A<br>EP 0605497 A<br>ES 2085035 T<br>GR 3019750 T<br>GR 3030291 T<br>HU 75165 A<br>JP 2683575 B<br>JP 6510772 T<br>KR 141504 B | 15-04-1996<br>26-09-1996<br>27-04-1993<br>01-04-1993<br>13-07-1994<br>25-04-1996<br>05-08-1996<br>01-04-1993<br>13-07-1994<br>16-05-1996<br>31-07-1996<br>30-09-1999<br>28-04-1997<br>03-12-1997<br>01-12-1994<br>01-06-1998 |
| US 5597844 A                              | 28-01-1997          | AU 5563494 A<br>EP 0670722 A<br>JP 8503482 T<br>CN 1095923 A<br>WO 9412180 A<br>ZA 9308825 A  | 22-06-1994<br>13-09-1995<br>16-04-1996<br>07-12-1994<br>09-06-1994<br>25-05-1995   |
| EP 514008 A                               | 19-11-1992          | AT 149348 T<br>CA 2066384 A<br>DE 69217711 D<br>DE 69217711 T<br>DK 514008 T<br>ES 2098447 T<br>GR 3023383 T<br>JP 5132416 A<br>KR 217165 B<br>SG 50480 A<br>US 5576025 A<br>US 5731006 A   | 15-03-1997<br>20-10-1992<br>10-04-1997<br>17-07-1997<br>12-05-1997<br>01-05-1997<br>29-08-1997<br>28-05-1993<br>01-09-1999<br>20-07-1998<br>19-11-1996<br>24-03-1998   |
| GB 935639 A                               |                     | NONE  |  |
| WO 9911245 A                              | 11-03-1999          | AU 9201198 A<br>CN 1265029 T<br>EP 1007009 A  | 22-03-1999<br>30-08-2000<br>14-06-2000   |
| WO 9917752 A                              | 15-04-1999          | US 5965167 A<br>AU 8495998 A<br>EP 0966272 A  | 12-10-1999<br>27-04-1999<br>29-12-1999   |

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
21 December 2000 (21.12.2000)

PCT

(10) International Publication Number  
**WO 00/76478 A1**

(51) International Patent Classification<sup>7</sup>: A61K 9/16, 9/20

(21) International Application Number: PCT/EP00/05356

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(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

MI99A001317 14 June 1999 (14.06.1999) IT

MI2000A000422 3 March 2000 (03.03.2000) IT

(71) Applicant (for all designated States except US):  
CIP-NINETY TWO-92 S.A. [PA/PA]; Edificio Vallario, Piso 6°, Calle 52 Y Ecuira Mendez, Panama City (PA).

(72) Inventors; and

(75) Inventors/Applicants (for US only): VILLA, Roberto [IT/PA]; Edificio Vallario, Piso 6°, Calle 52 Y Ecuira Mendez, Panama City (PA). PEDRANI, Massimo [IT/PA]; Edificio Vallario, Piso 6°, Calle 52 Y Ecuira Mendez, Panama City (PA). AJANI, Mauro [IT/PA]; Edificio Vallario, Piso 6°, Calle 52 Y Ecuira Mendez, Panama City (PA). FOSSATI, Lorenzo [IT/PA]; Edificio Vallario, Piso 6°, Calle 52 Y Ecuira Mendez, Panama City (PA).

(74) Agents: MINOJA, Fabrizio et al.; Bianchetti Bracco Minoja S.r.l., Via Rossini, 8, I-20122 Milano (IT).

(81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published:

- With international search report.
- Before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: CONTROLLED RELEASE AND TASTE MASKING ORAL PHARMACEUTICAL COMPOSITIONS

(57) Abstract: Controlled release and taste masking compositions containing one or more active principles inglobated in a three-component matrix structure, i.e. a structure formed by successive amphiphilic, lipophilic or inert matrices and finally inglobated or dispersed in hydrophilic matrices. The use of a plurality of systems for the control of the dissolution of the active ingredient modulates the dissolution rate of the active ingredient in aqueous and/or biological fluids, thereby controlling the release kinetics in the gastrointestinal tract.



WO 00/76478 A1

CONTROLLED RELEASE AND TASTE MASKING ORAL PHARMACEUTICAL  
COMPOSITIONS

The present invention relates to controlled release and taste-masking compositions containing one or more active principles incorporated in a three-component matrix structure, i.e. a structure formed by successive amphiphilic, lipophilic or inert matrices and finally incorporated or dispersed in hydrophilic matrices. The use of a plurality of systems for the control of the dissolution of the active ingredient modulates the dissolution rate of the active ingredient in aqueous and/or biological fluids, thereby controlling the release kinetics in the gastrointestinal tract, and it also allows the oral administration of active principles having unfavourable taste characteristics or irritating action on the mucosae of the administration site, particularly in the buccal area.

The compositions of the invention can contain active principles belonging to the therapeutical classes of analgesics, antiinflammatories, cardioactives, tranquillizers, antihypertensives, disinfectants and topical antimicrobials, antiparkinson drugs, antihistamines and are suitable to the oral administration or for acting topically at some areas of the gastrointestinal tract.

TECHNOLOGICAL BACKGROUND

The preparation of a sustained, controlled, delayed or anyhow modified release form can be carried out according to different known techniques:

1. The use of inert matrices, in which the main component of the matrix structure opposes some resistance to the penetration of the solvent due to the poor affinity towards aqueous fluids; such property being known as lipophilia.

2. The use of hydrophilic matrices, in which the main component of the matrix structure opposes high resistance to the progress of the solvent, in that the presence of strongly hydrophilic groups in its chains, mainly branched, remarkably increases viscosity inside the hydrated layer.

3. The use of bioerodible matrices, which are capable of being degraded by the enzymes of some biological compartment.

All the procedures listed above suffer, however, from drawbacks and imperfections.

Inert matrices, for example, generally entail non-linear, but esponential, release of the active ingredient.

Hydrophilic matrices have a linear behaviour until a certain fraction of active ingredient has been released, then they significantly deviate from linear release.

Bioerodible matrices are ideal to carry out the so-called "site-release", but they involve the problem of finding the suitable enzyme or reactive to degradation. Furthermore, they frequently release in situ metabolites that are not wholly toxicologically inert.

A number of formulations based on inert lipophilic matrices have been described: Drug Dev. Ind. Pharm. 13 (6), 1001-1022, (1987) discloses a process making use of varying amounts of colloidal silica as a porization element for a lipophilic inert matrix in which the active ingredient is incorporated.

The same notion of canalization of an inert matrix is described in US 4,608,248 in which a small amount of a hydrophilic polymer is mixed with the substances forming an inert matrix, in a non sequential compenetration of different matrix materials.

EP 375,063 discloses a technique for the preparation of multiparticulate granules for the controlled-release of

the active ingredient which comprises co-dissolution of polymers or suitable substances to form a inert matrix with the active ingredient and the subsequent deposition of said solution on an inert carrier which acts as the core of the device. Alternatively, the inert carrier is kneaded with the solution containing the inert polymer and the active ingredient, then the organic solvent used for the their dissolution is evaporated off to obtain a solid residue. The resulting structure is a "reservoir", i.e. is not macroscopically homogeneous along all the symmetry axis of the final form.

The same "reservoir" structure is also described in Chem. Pharm. Bull. 46 (3), 531-533,, (1998) which improves the application through an annealing technique of the inert polymer layer which is deposited on the surface of the pellets.

To the "reservoir" structure also belong the products obtained according to the technique described in WO 93/00889 which discloses a process for the preparation of pellets in hydrophilic matrix which comprises:

- dissolution of the active ingredient with gastro-resistant hydrophilic polymers in organic solvents;
- drying of said suspension;
- subsequent kneading and formulation of the pellets in a hydrophilic or lipophilic matrix without distinction of effectiveness between the two types of application.

EP 0 453 001 discloses a multiparticulate with "reservoir" structure inserted in a hydrophilic matrix. The basic multiparticulate utilizes two coating membranes to decrease the release rate of the active ingredient, a pH-dependent membrane with the purpose of gastric protection and a pH-independent methacrylic membrane with the purpose of slowing down the penetration of the aqueous fluid.

WO 95/16451 discloses a composition only formed by a



hydrophilic matrix coated with a gastro-resistant film for controlling the dissolution rate of the active ingredient.

When preparing sustained-, controlled- release dosage forms of a medicament topically active in the gastrointestinal tract, it is important to ensure a controlled release from the first phases following administration, i.e. when the inert matrices have the maximum release rate inside the logarithmic phase, namely the higher deviation from linear release.

Said object has been attained according to the present invention, through the combination of an amphiphilic matrix inside an inert matrix, the latter formulated with a lipophilic polymer in a superficial hydrophilic matrix. The compositions of the invention are characterized by the absence of a first phase in which the medicament superficially present on the matrix is quickly solubilized, and by the fact the the amphiphilic layer compensate the lack of affinity of the aqueous solvent with the lipophilic compounds forming the inner inert matrix.

#### DISCLOSURE OF THE INVENTION

The invention provides controlled release and taste masking oral pharmaceutical compositions containing an active ingredient, comprising:

- a) a matrix consisting of lipophilic compounds with melting point lower than 90°C and optionally by amphiphilic compounds in which the active ingredient is at least partially incorporated;
- b) optionally an amphiphilic matrix;
- c) an outer hydrophilic matrix in which the lipophilic matrix and the optional amphiphilic matrix are dispersed;
- d) optionally other excipients.

A particular aspect of the invention consists of controlled release oral compositions containing one or more

active ingredients comprising:

a) a matrix consisting of amphiphilic compounds and lipophilic compounds with melting point below 90°C in which the active ingredient is at least partially incorporated;

5 b) an outer hydrophilic matrix in which the lipophilic/amphiphilic matrix is dispersed;

c) optional other excipients.

A further aspect of the invention provides taste masking oral pharmaceutical compositions containing one or more active ingredients comprising:

- an inert or lipophilic matrix consisting of C6-C20 alcohols or C8-C20 fatty acids or esters of fatty acids with glycerol or sorbitol or other polyalcohols with carbon atom chain not higher than six;

15 - an amphiphilic matrix consisting of polar lipids of type I or II or glycols partially etherified with C1-C4 alkyl chains;

- an outer hydrophilic matrix containing the above matrices, mainly formed by saccharide, dextrin, polyalcohol or cellulose compounds or by hydrogels;

20 - optional excipients to give stability to the pharmaceutical formulation.

#### DETAILED DISCLOSURE OF THE INVENTION

The compositions of the invention can be prepared by a method comprising the following steps:

a) the active ingredient is first inglobated by simple kneading or mixing in a matrix or coating consisting of compounds having amphiphilic properties, which will be further specified below. The active principle(s) can be mixed with the amphiphilic compounds without the aid of solvents or with small amounts of water-alcoholic solvents.

30 b) The matrix obtained in a) is incorporated in a low melting lipophilic excipient or mixture of excipients, while heating to soften and/or melt the excipient itself,

which thereby incorporates the active ingredient by simple dispersion. After cooling at room temperature an inert matrix forms, which can be reduced in size to obtain inert matrix granules containing the active ingredient particles.

5           c)   The inert matrix granules are subsequently mixed together with one or more hydrophilic water-swelling excipients. The mixture is then subjected to compression or  
10   tableting. This way, when the tablet is contacted with biological fluids, a high viscosity swollen layer is formed, which coordinates the solvent molecules and acts as  
15   a barrier to penetration of the aqueous fluid itself inside the new structure. Said barrier antagonizes the starting "burst effect" caused by the dissolution of the medicament inglobated inside the inert matrix, which is in its turn inside the hydrophilic matrix.

          The amphiphilic compounds which can be used according to the invention comprise polar lipids of type I or II (lecithin, phosphatidylcholine, phosphatidylethanolamine), ceramides, glycol alkyl ethers such as diethylene glycol  
20   monomethyl ether (Transcutol<sup>(R)</sup>).

          The lipophilic matrix consists of substances selected from unsaturated or hydrogenated alcohols or fatty acids, salts, esters or amides thereof, fatty acids mono-, di- or triglycerids, the polyethoxylated derivatives thereof,  
25   waxes, ceramides, cholesterol derivatives or mixtures thereof having melting point within the range of 40 to 90°C, preferably from 60 to 70°C.

          If desired, a fatty acid calcium salt may be incorporated in the lipophilic matrix which is subsequently  
30   dispersed in a hydrophilic matrix prepared with alginic acid, thus remarkably increasing the hydrophilic matrix viscosity following penetration of the solvent front until contact with the lipophilic matrix granules dispersed inside.

According to an embodiment of the invention, an amphiphilic matrix with high content in active ingredient, typically from 5 to 95% w/w, is first prepared by dispersing the active ingredient or the mixture of active ingredients in a mixture of amphiphilic compounds, such as lecithin, other type II polar lipids, surfactants, or in diethylene glycol monoethyl ether; the resulting amphiphilic matrix is then mixed or kneaded, usually while hot, with lipophilic compounds suitable to form an inert matrix, such as saturated or unsaturated fatty acids, such as palmitic, stearic, myristic, lauric, laurylic, or oleic acids or mixtures thereof with other fatty acids with shorter chain, or salts or alcohols or derivatives of the cited fatty acids, such as mono-, di-, or triglycerids or esters with polyethylene glycols, alone or in combination with waxes, ceramides, cholesterol derivatives or other apolar lipids in various ratios so that the melting or softening points of the lipophilic compounds mixtures is within the range of 40° to 90°C, preferably from 60 to 70°C.

Alternatively, the order of formation of the inert and amphiphilic matrices can be reversed, incorporating the inert matrix inside the amphiphilic compounds.

The resulting inert lipophilic matrix is reduced into granules by an extrusion and/or granulation process, or any other known processes which retain the homogeneous dispersion and matrix structure of the starting mixture.

The hydrophilic matrix consists of excipients known as hydrogels, i.e. substances which when passing from the dry state to the hydrated one, undergo the so-called "molecular relaxation", namely a remarkable increase in mass and weight following the coordination of a large number of water molecules by the polar groups present in the polymeric chains of the excipients themselves.

Examples of hydrogels which can be used according to the invention are compounds selected from acrylic or methacrylic acid polymers or copolymers, alkylvinyl polymers, hydroxyalkyl celluloses, carboxyalkyl celluloses, polysaccharides, dextrans, pectins, starches and derivatives, natural or synthetic gums, alginic acid.

In case of taste-masking formulations, the use of polyalcohols such as xylitol, maltitol and mannitol as hydrophilic compounds can also be advantageous.

The lipophilic matrix granules containing the active ingredient are mixed with the hydrophilic compounds cited above in a weight ratio typically ranging from 100:0.5 to 100:50 (lipophilic matrix: hydrophilic matrix). Part of the active ingredient can optionally be mixed with hydrophilic substances to provide compositions in which the active ingredient is dispersed both in the lipophilic and the hydrophilic matrix, said compositions being preferably in the form of tablets, capsules and/or minitables.

The compression of the mixture of lipophilic and/or amphiphilic matrix, hydrogel-forming compound and, optionally, active ingredient not inglobated in the lipophilic matrix, yields a macroscopically homogeneous structure in all its volume, namely a matrix containing a dispersion of the lipophilic granules in a hydrophilic matrix. A similar result can also be obtained by coating the lipophilic matrix granules with a hydrophilic polymer coating.

The tablets obtainable according to the invention can optionally be subjected to known coating processes with a gastro-resistant film, consisting of, for example, methacrylic acids polymers (Eudragit<sup>(R)</sup>) or cellulose derivatives, such as cellulose acetophthalate.

Active ingredients which can conveniently be formulated according to the invention comprise:

- analgesics, such as acetaminophen, phenacetin, sodium salicylate;
- antitussives, such as dextromethorphan, codeine phosphate;
- 5       - bronchodilators, such as albuterol, procaterol;
- antipsychotics, such as haloperidol, chlorpromazine;
- antihypertensives and coronary-dilators, such as isosorbide mono- and dinitrate, captopril;
- 10       - selective  $\beta$  2 antagonists such as salbutamol, terbutaline, ephedrine, orciprenaline sulfate;
- calcium antagonists, such as nifedipine, nicardipine, diltiazem, verapamil;
- antiparkinson drugs, such as pergolide,
- 15       carbidopa, levodopa;
- non steroid anti-inflammatory drugs, such as ketoprofen, ibuprofen, diclofenac, diflunisal, piroxicam, naproxen, ketorolac, nimesulide, thiaprophenic acid, mesalazine (5-aminosalicylic acid);
- 20       - antihistamines, such as terfenadine, loratadine;
- antidiarrheals and intestinal antiinflammatories, such as loperamide, 5-aminosalicylic, olsalazine, sulfasalazine, budenoside;
- spasmolytics such as octylonium bromide;
- 25       - anxiolytics, such as chlordiazepoxide, oxazepam, medazepam, alprazolam, donazepam, lorazepam;
- oral antidiabetics, such as glipizide, metformin, phenformin, gliclazide, glibenclamide;
- cathartics, such as bisacodil, sodium
- 30       picosulfate;
- antiepileptics, such as valproate, carbamazepine, phenytoin, gabapentin;
- antitumorals, such as flutamide, etoposide;
- oral cavity disinfectants or antimicrobials, such

as benzalkonium chloride, cetylpyridinium chloride or tibezoneum iodide, and some amino derivatives such as benzydamine and chlorhexidine as well as the salts and derivatives thereof;

5           - sodium fluoride.

The compositions of the invention can further contain conventional excipients, for example bioadhesive excipients such as chitosans, polyacrylamides, natural or synthetic gums, acrylic acid polymers.

10           The compositions of the invention can contain more than one active ingredient, each of them being optionally contained in the hydrophilic matrix or in the inert amphiphilic matrix, and are preferably in the form of tablets, capsules or minitabets.

15           In terms of dissolution characteristics, contact with water or aqueous fluids causes the immediate penetration of water inside the more superficial layer of the matrix which, thanks to the presence of the aqueous solvent, swells due to the distension of the polymeric chains of the hydrogels, giving rise to a high viscosity hydrated front  
20           which prevents the further penetration of the solvent itself linearly slowing down the dissolution process to a well determined point which can be located at about half the thickness, until the further penetration of water would  
25           cause the disintegration of the hydrophilic layer and therefore the release of the content which, consisting of inert matrix granules, however induces the diffusion mechanism typical of these structures and therefore further slows down the dissolution profile of the active  
30           ingredient.

The presence of the amphiphilic matrix inside the lipophilic matrix inert allows to prevent any unevenness of the release profile of the active ingredient. The surfactants present in the amphiphilic portion promote

wettability of the porous canaliculuses which cross the inert matrix preventing or reducing resistance to penetration of the solvent inside the inert matrix.

To obtain taste masking tablets, the components of the hydrophilic matrix are carefully selected to minimize the active substance release time through penetration accelerated by the canalization induced by the hydrophilic compound.

The following Examples illustrate the invention in greater detail.

#### EXAMPLE 1

500 g of 5-aminosalicylic acid and 20 g of octylonium bromide are mixed with 10 g of soy lecithin dissolved in 50 g of a water : ethyl alcohol 1:3 mixture at about 50°C. After homogenization and drying, the granules of the resulting matrix are treated in a kneader with 20 g of carnauba wax and 50 g of stearic acid, heating until homogeneous dispersion, then cold-extruded into small granules. The inert matrix granules are loaded into a mixer in which 30 g of carbopol 971 P and 65 g of hydroxypropyl methylcellulose are sequentially added. After a first mixing step for homogeneously dispersing the powders, 60 g of microcrystalline cellulose and 5 g of magnesium stearate are added. After mixing, the final mixture is tableted to unitary weight of 760 mg/tablet. The resulting tablets are film-coated with cellulose acetophthalate or polymethacrylates and a plasticizer to provide gastric resistance and prevent the early release of product in the stomach.

The resulting tablets, when subjected to dissolution test in simulated enteric juice, have shown a release of the active principles having the following profile: after 60 minutes no more than 30%, after 180 minutes no more than 60%, after 5 hours no more than 80%.



**EXAMPLE 2**

50 g of diethylene glycol monoethyl ether are homogeneously distributed on 500 g of microcrystalline cellulose; then 100 g of Budesonide are added, mixing to  
5 complete homogenization. This mix is further added with 400 g of Budesonide, then dispersed in a blender containing 100 g of carnauba wax and 100 g of stearic acid preheated at a temperature of 60°C. After kneading for 5 minutes, the mixture is cooled to room temperature and extruded in  
10 granules of size below 1 mm.

A suitable mixer is loaded with the matrix granules prepared as above and the following amounts of hydrophilic excipients: 1500 g of hydroxypropyl methylcellulose and 500 g of polycarbophil.

15 The components are mixed until homogeneous dispersion of the matrices, then added with 2450 g of microcrystalline cellulose, 400 g of lactose, 100 g of colloidal silica and 50 g of magnesium stearate. After further 5 minute mixing, the mix is tabletted to unitary weight of 250 mg/tablet.

**EXAMPLE 3**

850 g of metformin are dispersed in a granulator/kneader with 35 g of diethylene glycol monoethyl ether previously melted with 100 g of stearic acid and 55 g of carnauba wax. The system is heated to carry out the  
25 granulation of the active ingredient in the inert matrix. The resulting 1040 g of formulation are added with 110 g of hydroxypropyl methylcellulose and 20 g of magnesium stearate.

The final mixture is tabletted to unitary weight of  
30 1170 mg/tablet equivalent to 850 mg of active ingredient.

The resulting tablets, when subjected to dissolution test in simulated enteric juice, have shown a release of the active principles having the following profile: after 60 minutes no more than 35%, after 180 minutes no more than

60%, after 5 hours no more than 80%.

#### EXAMPLE 4

120 g of octylonium bromide are dispersed in a granulator/kneader with 30 g of stearic acid and 15 g of beeswax in which 10 g of diethylene glycol monoethylene had previously been melted.

The system is heated to carry out the granulation of the active ingredient in the inert matrix. The resulting 10 g of formulation are added with 5 g of hydroxypropyl methylcellulose and 5 g of polycarbophyl, 2 g of magnesium stearate and 3 g of microcrystalline cellulose.

The final mixture is tabletted to unitary weight of 200 mg/tablet equivalent to 120 mg of active ingredient.

The resulting tablets, when subjected to dissolution test in simulated enteric juice, have shown a release of the active principles having the following profile: after 60 minutes no more than 25%; after 180 minutes no more than 50%; after 5 hours no more than 70%.

#### EXAMPLE 5

12 g of diethylene glycol monoethyl ether are loaded on 6 g of microcrystalline cellulose and 6 grams of calcium carbonate, then 100 g of Gabapentin are added and the mixture is homogenized. After that, 800 g of Gabapentin are added which are dispersed in a granulator/kneader with 4.5 g of white wax and 5 g of stearic acid. The system is heated to carry out the granulation of the active ingredient in the inert matrix. The resulting 916.5 g of formulation are added with 39.5 g of hydroxypropyl methylcellulose, 10 g of alginic acid, 11 g of magnesium stearate and 6 g of syloid. The final mixture is tabletted to unitary weight of 1000 mg/tablet equivalent to 900 mg of active ingredient.

#### EXAMPLE 6

50 g (25 g) of carbidopa and 200 g (100 g) of levodopa

are dispersed in a granulator/kneader with 60 g (30 g) of stearic acid and 30 g (15 g) of yellow wax, in which 10 (5) g of diethylene glycol monoethyl ether had previously been melted.

5       The system is heated to carry out the granulation of the active ingredient in the inert matrix. The resulting 340 g (170 g) of formulation are added with 20 g (10 g) of hydroxypropyl methylcellulose, 10 g (5 g) of xantangum, 16 g (8 g) of microcrystalline cellulose, 4 g (2 g) of  
10       magnesium stearate.

The final mixture is tabletted to unitary weight of 400 (200) mg/tablet equivalent to 50(25) mg of carbidopa and 200 (100) mg di levodopa.

#### EXAMPLE 7

15       4 g of Nimesulide are solubilised in 50 g of diethylene glycol monoethyl ether, then 100 g of microcrystalline cellulose are added to obtain a homogeneous mixture.

The resulting mixture is added in a granulator/kneader  
20       with 196 g of Nimesulide, 50 g of stearic acid and 25 g of carnauba wax. The system is heated to carry out the granulation of the active ingredient in the inert and amphiphilic matrix system.

425 g of the resulting granulate are added with 60 g  
25       of hydroxypropyl methylcellulose, 5 g of polycarbophil and 10 g of magnesium stearate.

The final mixture is tabletted to unitary weight of 500 mg/tablet equivalent to 200 mg of active ingredient.

The resulting tablets, when subjected to dissolution  
30       test in simulated enteric juice, have shown a release of the active principles having the following profile: after 1 hour no more than 25%, after 2 hours no more than 40%, after 4 hours no more than 60%, after 8 hours no more than 90%.

**EXAMPLE 8**

500 g of propionyl carnitine are dispersed in a granulator/kneader with 90 g of stearic acid and 40 g of carnauba wax, in which 20 g of diethylene glycol monoethyl ether had previously been melted. The system is heated to carry out the granulation of the active ingredient in the inert/amphiphilic matrix. The resulting 650 g of formulation are added with 60 g of hydroxypropyl methylcellulose and 10 g of magnesium stearate.

The final mixture is tabletted to unitary weight of 720 mg/tablet equivalent to 500 mg of active ingredient.

The resulting tablets, when subjected to dissolution test in simulated enteric juice, have shown a release of the active principles having the following profile: after 60 minutes no more than 40%, after 180 minutes no more than 60%, after 4 hours no more than 80%, after 8 hours no more than 90%.

**EXAMPLE 9**

One kg of Nimesulide is placed in a high rate granulator, pre-heated to about 70°, together with 200 g of cetyl alcohol and 25 g of glycerol palmitostearate; the mixture is kneaded for about 15 minutes and stirred while decreasing temperature to about 30°C. The resulting inert matrix is added, keeping stirring and kneading during cooling, with 50 g of soy lecithin and 50 g of ethylene glycol monoethyl ether. The granulate is extruded through a metallic screen of suitable size and mixed with 50 g of hydroxypropyl methylcellulose, 1320 kg of maltodextrins, 2 kg of lactose-cellulose mixture, 50 g of colloidal silica, 40 g of aspartame, 150 g of citric acid, 75 g of flavour and 65 g of magnesium stearate. The final mixture is tabletted to unitary weight of about 500 mg, having hardness suitable for being dissolved in the mouth and a pleasant taste.

**EXAMPLE 10**

Operating as in the preceding example, chewable tablets are prepared replacing dextrin with mannitol and the lactose-cellulose mixture with xylitol. The resulting  
5 tablets have pleasant taste and give upon chewing a sensation of freshness enhancing the flavour.

**EXAMPLE 11**

Operating as described in example 9, but with the following components:

|    |   |   |        |
|----|---|---|--------|
| 10 | - | active ingredient: ibuprofen            | mg 100 |
|    | - | lipophilic/inert matrix component:      |        |
|    |   | cetyl alcohol                           | mg 15  |
|    | - | amphiphilic matrix component:           |        |
|    |   | soy lecithin                            | mg 8   |
| 15 | - | hydrophilic matrix components: mannitol | mg 167 |
|    | - | maltodextrins                           | mg 150 |
|    | - | methylhydroxypropylcellulose            | mg 30  |
|    | - | adjuvants: aspartame                    | mg 15  |
|    | - | flavour                                 | mg 5   |
| 20 | - | colloidal silica                        | mg 5   |
|    | - | magnesium stearate                      | mg 5   |

500 mg unitary weight tablets are obtained, which undergo progressive erosion upon buccal administration, and effectively mask the bitter, irritating taste of the active  
25 ingredient.

**EXAMPLE 12**

Operating as described in example 9, but with the following components:

|    |   |                                      |       |
|----|---|--------------------------------------|-------|
|    | - | active ingredient: diclofenac sodium | mg 25 |
| 30 | - | lipophilic/inert matrix component:   |       |
|    |   | cetyl alcohol                        | mg 5  |
|    | - | glycerol palmitostearate             | mg 5  |
|    | - | amphiphilic matrix component:        |       |
|    |   | soy lecithin                         | mg 7  |

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- hydrophilic matrix components: xylitol mg 168
- maltodextrins mg 150
- hydroxypropylmethylcellulose mg 20
- adjuvants: aspartame mg 5
- 5 - flavour mg 5
- colloidal silica mg 5
- magnesium stearate mg 5

400 mg unitary weight tablets are obtained, which undergo progressive erosion upon buccal administration, and effectively mask the irritating taste of the active ingredient.

**EXAMPLE 13**

Operating as described in example 9, but with the following components:

- 15 - active ingredient: chlorhexidine mg 2,5
- lipophilic/inert matrix component:
- cetyl alcohol mg 0.5
- glycerol palmitostearate mg 0.5
- amphiphilic matrix component:
- 20 diethylene glycol monoethyl ether mg 0.3
- hydrophilic matrix components: xylitol mg 38
- maltodextrins mg 96
- hydroxypropyl methylcellulose mg 10
- adjuvants: aspartame mg 3
- 25 - flavour mg 5
- colloidal silica mg 2
- magnesium stearate mg 2

150 mg unitary weight tablets are obtained, which undergo progressive erosion upon buccal administration, and effectively mask the irritating taste of the active ingredient.

**EXAMPLE 14**

One Kg of Nimesulide is placed in a high rate granulator, pre-heated to about 70°, together with g 125 of

cetyl alcohol: the mixture is kneaded for about 15 minutes and stirred while decreasing temperature to about 30°C, then added with g 30 of lecithin. The resulting matrix is then extruded through a metallic screen of suitable size and mixed with 2.415 kg of lactose, 1.0 kg of maltodextrins, 50 g of hydroxypropyl methylcellulose, 50 g of colloidal silica, 40 g of aspartame, 150 g of citric acid, 75 g of flavour and 65 g of magnesium stearate. The final mixture is tabletted to about 500 mg tablets, having hardness suitable for being dissolved in the mouth and pleasant taste.

CLAIMS

1. Controlled release and taste-masking oral pharmaceutical compositions containing an active ingredient, comprising:

a) a matrix consisting of lipophilic compounds with melting point lower than 90°C in which the active ingredient is at least partially inglobated;

b) optionally an amphiphilic matrix;

c) an outer hydrophilic matrix in which the lipophilic matrix and the optional amphiphilic matrix are dispersed;

d) optionally other excipients.

2. Controlled release compositions as claimed in claim 1 comprising a lipophilic or inert matrix consisting of lipophilic compounds with melting point below 90°C in which the active ingredient is at least partially inglobated and a hydrophilic matrix.

3. Taste-masking formulations as claimed in claim 1 comprising a lipophilic matrix, an amphiphilic matrix and a hydrophilic matrix, in which the lipophilic matrix consists of C6-C20 alcohols or C8-C20 fatty acids or esters of fatty acids with glycerol or sorbitol or other polyalcohols with carbon atom chain not higher than six.

4. Compositions as claimed in any one of claims 1 to 3 in which the amphiphilic compounds are polar lipids of type I or II (lecithin, phosphatidylcholine, phosphatidylethanolamine), ceramides, glycol alkyl ethers, esters of fatty acids with polyethylene glycols or diethylene glycols.

5. Compositions as claimed in claim 1, 2 or 3, in which the lipophilic matrix consists of compound selected from unsaturated or hydrogenated alcohols or fatty acids, salts, esters or amides thereof, mono-, di- or triglycerids of



fatty acids, the polyethoxylated derivatives thereof, waxes, cholesterol derivatives.

6. Compositions as claimed in any one of the above claims, in which the hydrophilic matrix consists of  
5 hydrogel-forming compounds.

7. Compositions as claimed in claim 6 in which the hydrophilic matrix consists of compounds selected from acrylic or methacrylic acid polymers or copolymers, alkylvinyl polymers, hydroxyalkylcellulose,  
10 carboxyalkylcellulose, polysaccharides, dextrans, pectins, starches and derivatives, alginic acid, natural or synthetic gums, polyalcohols.

8. Compositions as claimed in any one of the above claims, comprising a gastro-resistant coating.

9. Compositions as claimed in claim 8, in which the  
15 gastro-resistant coating consists of methacrylic acid polymers or cellulose derivatives.

10. Compositions as claimed in any one of the above claims, in which the active ingredient is wholly contained  
20 in the inert/amphiphilic matrix, in the form of tablets, capsules or minitabets.

11. Compositions as claimed in any one of claims 1 to 10 in which the active ingredient is dispersed both in the hydrophilic matrix and in the lipophilic/amphiphilic  
25 matrix, in the form of tablets, capsules or minitabets.

12. Compositions as claimed in any one of the above claims, in which the active ingredient belongs to the therapeutical classes of analgesics, antitussives, bronchodilators, antipsychotics, selective  $\beta$  2 antagonists, calcium antagonists, antiparkinson drugs, non-steroidal  
30 antiinflammatory drugs, antihistamines, antidiarrheals and intestinal antiinflammatories, spasmolytics, anxiolytics, oral antidiabetics, cathartics, antiepileptics, topical antimicrobials.

13. Compositions as claimed in claim 11, in which the active ingredient is selected from mesalazine (5-aminosalicylic acid), budesonide, metformin, octylonium bromide, gabapentin, carbidopa, nimesulide, propionylcarnitine, isosorbide mono- and dinitrate, naproxen, ibuprofen, ketoprofen, diclofenac, thiaprophenic acid, nimesulide, chlorhexidine, benzydamine, tibezone iodide, cetylpyridinium chloride, benzalkonium chloride, sodium fluoride.

14. Compositions as claimed in any one of the above claims, containing bioadhesive substances.

15. Pharmaceutical compositions as claimed in the above claims, in the form of tablets chewable or erodible in the buccal cavity or in the first portion of the gastrointestinal tract.